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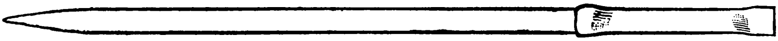

FIG. 2.

Upon the same principle, a very convenient pipet may be constructed, by slipping a short piece of rubber tubing over one end of a glass tube which has the other end drawn to a small opening. The open end of the rubber tube should be closed by a piece of cork.

## VARIATIONS IN DOMINANT SPECIES OF PLANTS.

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One of the most important propositions offered by Mr. Darwin, in discussing the subject of "Variations in Nature," is, that "wide-ranging, much-diffused and common species vary most."* One would naturally suppose that such a proposition, if true, could be easily demonstrated by many illustrations from nature, seeing that so many of our native species are far-reaching in their habitat, extending over vast areas of the United States, and even of the American continent, encountering an endless variety of soils and extreme changes of temperature and moisture.

For the purpose of ascertaining how far such a demonstration could be carried out from a study of the most common and widely diffused of our Western species of flowering plants, I have gathered together such notes of original observation and material from reports of other writers as form the basis of this paper. Not having determined upon such a purpose, however, until late in the summer season, I have only collated sufficient material for a preliminary discussion of the subject.

The first thing to impress the careful observer is the fact, often repeated, that that there is variation *everywhere*, and the more carefully one observes the greater the amount of variation that is noted, until it appears to be entirely without limit and becomes extremely delicate and infinitesimal, such as would be wholly overlooked by the indifferent observer.

It may be convenient to look upon the differences arising through variations as being of several grades, namely, individual, varietal, specific, generic, etc., corresponding to the different terms individual, variety, species, genus, etc., used in the classification of the living forms, although the former shade into each other exactly as do the latter.

In discussing the subject at hand, I shall have mainly to do with varietal differences, which, however, are simply individual differences increased, and finally made permanent, through the power of hereditary transmission.

Species of plants tend to accommodate themselves, through variation principally, to four different changes of environment — changes of soil, moisture, light, and temperature. As the territory covered by the notes and observations of this paper is comparatively small, including Kansas, Indian Territory, as far as the Canadian river, Panhandle, Texas, and eastern Colorado (although references will be made at times to other districts), the elements of light and temperature will not be so important as those of soil and moisture.

I shall now continue the immediate discussion of my subject under four different heads: (1) Variations in size, that is, of the entire plant, or any part of it; (2) variations in morphology; (3) variations in the character of the trichomes, or surface appendages; and (4) variations in color, mainly of the flower.

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*Darwin "Origin of Species," ch. 11, p. 42.

### I.—Variations in Size.

It would be impossible to bring together all the illustrations that might properly be included under this head; and I shall only refer to a considerable number of those cases that furnish the most positive proof of our proposition.

*Œnothera serrulata* Nutt.—And its forms should probably be placed first in this list of illustrations. It is well distributed over by far the greater portion of the United States, accompanied by a number of described varieties and a limitless number of intermediate forms. There is great variation in the size of the entire plant and of the leaf and flower, the flowers ranging in size from nearly two inches across to a little more than half an inch. Its largest representatives are found eastward, as a rule, and it becomes smaller farther and farther into the sandy districts of the southwest and on the summits of rocky hills. I have myself found at least three distinct forms of this species, with many intermediate grades. The largest form was noted on the prairies of the Pottawatomie country, in central Indian Territory; the smallest on the gypsum hills and in sandy districts of western Indian Territory and Panhandle, Texas, and a form intermediate in various places in Kansas and the other two countries first named. Two large-flowered varieties are mentioned in the manual of western Texas plants* as occurring in that region.

*Panicum virgatum* L.—One of our most common and widely diffused American grasses—is simply invariable in its variableness. It varies in the general coarseness of the plant and the size of the spikelets. Yet, it may be noted that this species has but one published North American variety (according to Oyster's "List"); and it should be remarked here that one cannot always determine upon the amount of variations of a particular species from the number of its described varieties, as the variations, although quite numerous and extremely diverse, may not be sufficient in *degree* for the establishment of a new variety.

*Grindelia squarrosa* Dunal— Presents considerable variations in the size of leaf and flower head. Its variety *grandiflora* Gray is well known.

*Tradescantia pilosa* Lehm.—Very wide ranging; grows gradually, but considerably, smaller, from eastern Kansas to New Mexico.

Other common species that vary in size may be noted, as follows:

*Engelmannia pinnatifida* T. & G.—Grows smaller to the westward.

*Chrysopsis villosa* Nutt.—Varies in size of head, and of the whole plant.

*Petalostemon violaceus* Mx.—Varies extremely, principally in size of heads. A form, seemingly constant, found in Morton county, Kansas, is probably var. *tenuis* Coulter.†

*Petalostemon candidus* Mx.—Varies also as the last.

*Aplopoppus spinulosus* DC.—Varies in size of heads.

Then there is the great host of asters and solidagos that vary so much that the varieties, and even some species, with their multitude of intermediate forms, present almost inextricable confusion. Among them may be mentioned:

*Aster multiflorus* Ait.
*A. ericoides* L.
*A. salicifolius* (Lam.?) Ait.
*Solidago canadensis* L. with several varieties.
*S. missouriensis* Nutt. and numerous varieties.
*S. serotina* Ait.
*S. occidentalis* Nutt., etc.

All these are extremely common and wide ranging.

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*J. M. Coulter, "Manual of the Phanerogams and Pteridophytes of Western Texas," page 117, No. 23.

†Coulter—"Manual of the Phanerogams and Pteridophytes of Texas," Polypetalæ, p. 79, No. 4.

### II.—VARIATIONS IN MORPHOLOGY.

Variations in the form of the *leaf* seem to be the most common under this head.

*Callirrhoe involucrata* Gray—Is one of the most variable, in this respect, of our common species. The form of the leaf ranges from entire to many cleft, while even "the segments themselves may be lobed."

*Vitis riparia* Mx.—Also presents great variations in form of the leaf, ranging from entire to deeply 3-lobed.

Several species of *Phaseolus*, quite common, show great variations in leaf morphology, especially in *Phaseolus diversifolius* Pers.*

*Grindelia squarrosa* Dun. and forms—Show great variations in the form of the leaf, and involucral bracts especially.

Variations in the forms of compound leaves are very diverse, and were fully and ably discussed in a paper at the preceding meeting of this Academy of Science.†

*Carex straminea* Schk.—Is well known to be extremely variable, and also common. It varies principally in the form and arrangement of the spike and spikelets. It has a number of published varieties, and numberless intermediate forms.

*Carex laxiflora* Lam.—Varies also as the last, and in the form of the leaf. Very common.

There are many instances known of the doubling of flowers among common species, but these seem to be monstrosities, appearing only for a time, as there is apparently no case on record, so far as I know, where such variations became constant among wild plants.

Other species that may be added are:

*Œnothera sinuata* L.—Varies in form of leaf.

*Gaillardia pulchella* Foug.—Varies in form of leaf.

*Verbena bipinnatifida* Nutt.—Varies in form of leaf.

*Anemone decapetala* L.—Varies in form of leaf.

*Aplopappus spinulosus* DC.—Varies in leaf morphology.

*Panicum crus-galli* L.—Varies in all parts.

*Senecio douglasii* DC.—Varies greatly in form of leaf.

### III.—VARIATIONS IN TRICHOMES.

*Aplopappus spinulosus* DC.—Is one of the most variable species in the develop- of trichomes, and, at the same time, a very common species, and widely diffused. It varies from smooth to whitish woolly, with all intermediate forms. Have collected three different forms at Tascosa and Canadian City, Tex.—one of them entirely smooth. Reported from Colorado with "soft, minute woolly pubescence.‡

*Chrysopis villosa* Nutt.—"Extremely variable in the size and shape of the leaves, in the number of the flower heads, and in the *kind and amount of pubescence.* It includes several *nominal* species. Common *everywhere*, at *all* elevations." §

The above description of this species is so completely confirmed by my own observations, that I copy it entire. Have collected specimens, showing several stages in the development of trichomes, at different places in southwest Kansas, western Indian Territory, and Texas panhandle.

Others may be added, as follows:

*Engelmannia pinnatifida* T. & G.—Flower heads more hairy, seemingly, farther westward.

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*A recent revision makes this species *Strophostyles angulosa* Ell. (Watson in Gray's Manual, 6th ed., p. 145).

†Mrs. W. A. Kellerman—"Evolution in Leaves," Trans. Kas. Acad. Sci., vol. XII, part 2, p. 168-173.

‡Porter & Coulter—"Flora of Colorado," p. 65.

§L. c., p. 67.

*Rudbeckia hirta* L.—Plant more hispid in some localities than in others.

*Œnothera sinuata* L.—Varies in the amount of pubescence.

*Grindelia squarrosa* Dun.—Considerable variation in the degree of viscosity.

*Senecio douglasii* DC.—Varies extremely, from glabrate green to white tomentose. Very common all over the southwestern great plains.

*Riddellia tagetina* Nutt.—Varies in amount of pubescence, and is quite common.

Several species of *Astragalus* vary extremely in the amount of pubescence, especially *Astragalus lotiflorus* Hook.

### IV.—Variations in Color.

*Viola tricolor* L.—With its various forms, is perhaps the most variable in color of all our common species. The color of the flower is of all shades from "purple through white to yellow," and it is well known that from it have sprung all our cultivated pansies, with their many and variegated colors.

*Oxalis violacea* L.—Often presents pure white flowers, in certain isolated spots.

*Viola palmata* L.; var. *cucullata* Gray—Often shows white flowers, especially in woods.

*Lepachys columnaris* T. & G., with its var. *pulcherrima* T. & G., and intermediate forms, are striking examples of variation in color. Illustrations of all the various shades, graduating from the one extreme to the other, can easily be found in southwest Kansas.

*Lepachys tagetes* Gray—Presents various shades of color in flowering, exactly corresponding to those of the last. Have collected the various forms in southwest Kansas. This species, however, does not seem to be very widely diffused.

Others may be added, as follows:

*Tradescantia virginica* L.—Various shades of purple, blue, and red.

*Sisyrinchium mucronatum* Mx. and

*S. anceps* L.—various shades of blue.

*Callirrhoe involucrata* Gray—Various shades of purple and red, and sometimes nearly white.*

*Aster multiflorus* Ait.—White and intermediate shades to blue.

*Phlox divaricata* L.—All shades, from violet to white and red.

*Schrankia uncinata* Willd.—Deep red to nearly white (rarely pure white, as noted in western Indian Territory).†

*Andropogon provincialis* Lam., and *Panicum crus-galli* L.—Vary greatly in color of all parts of the plant.

I shall now mention, on the other hand, a number of the most striking illustrations, among hundreds of others, of *constancy* in species. Nearly all are quite uncommon, but usually wide ranging:

*Peucedanum nudicaule* Nutt.—Quite rare, in my experience.

*Lithospermum hirtum* Lehm.—(Slightly variable in color of flower.)

*Redfieldia flexuosa* Vasey—In sand hills of the Southwest.

*Castilleia sessiliflora* Ph.

*Nasturtium sessiliflorum* Nutt.—(Slight variableness.)

*Atriplex expansa* Wats.—Southwestern great plains.

*Cleomella angustifolia* Torr.

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*As observed by the writer on North Canadian river, in neutral strip, Indian Territory, August, 1891.

†In Cheyenne and Arapahoe country, near a "black jack" grove, in the vicinity of Kingfisher. There the writer saw the most beautiful wild garden of these "sensitive roses" that he ever observed. It was a brilliant sight; and among the innumerable large specimens that fairly matted the ground were a few with pure white flowers.

*Astragalus bisulcatus* Gray.
*Dalea alopecuroides* Willd.—(Somewhat wide ranging, but not common.)
*Erigeron annuum* Nutt.—(Wide ranging, but uncommon.)
*Kochia americana* Wats.—(Restricted to saline soils.)
*Lupinus pusillus* Ph.—(In sandy districts.)
*Gaillardia simplex* Scheele—Quite rare in my experience.
*Oxytropis monticola* Gray—Also rare.
*Psoralea argophylla* Ph.
*Dalea lanata* Spreng.—(Rather plentiful, only in sandy districts.)
*Petalostemon villosus* Nutt.—(In sandy districts.)
*Townsendia sericea* Hook.—(Rather wide ranging, but uncommon.)

In concluding, I would urge that more attention be paid, in collecting specimens, to intermediate forms, or even monstrosities. If the main object in the teaching of natural history is to impress upon the mind of the student nature's laws of progressive development, and the wonderful adaptation of species to changes of environment, through variation and natural selection, is not this very object defeated by our efforts, usually, to have only perfect or typical representatives of species in our herbaria? Let all forms of different species be represented as nearly as possible. Let it be the *effort* to do this rather than to avoid it, even though by so doing we may not be able to accumulate so great a number of species. By these means, the student will be brought face to face more with the facts of nature as they *are*, and be taught by more natural and rational methods.

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# THERAPEUTIC VALUE OF SOME RECENTLY-INTRODUCED CHEMICALS.

BY L. E. SAYRE, PH. G.

Within the past few years, considerable attention has been paid to the physiological action and chemical constitution of many of the organic and synthetical preparations of the chemist. Many of these have been introduced into medicine under the title of new remedies. The study of the relation of physiological action and chemical constitution, according to a certain class of practitioners, has a promising future before it.

It will be impossible, in a short paper, to dilate upon the relations above referred to, but a few remarks relating to the benzine series may be at this time in place. It is well known by the chemist that when benzine ($C_6 H_6$) is decomposed by substituting OH for H in that compound, we have a powerful antiseptic and disinfectant, known as carbolic acid. An antiseptic of a very different nature is produced when one equivalent of H is substituted by carbhydroxyl COOH. The name of this compound is well known as benzoic acid. Still another important antiseptic and antipyretic is made by substituting two atoms of H of the benzine, one with OH, and the other with COOH, forming hydroxybenzoic acid or salicylic acid. This remedy, too well known to need description, is one of the most prominent of the therapeutic agents of this kind, used as an external and internal remedy.

The study of the ortho, meta, and para substitution products of benzine—the manner in which ethyl, methyl, propyl, etc., is combined in the "benzine ring," has occupied, for example—has been of intense interest. As before stated, I cannot do more than refer to these compounds, and in doing so shall select a few which have a